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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/768,182	02/02/2004	Hiroshi Nagasawa	NAGASAWA10	3666

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EXAMINER

BRUENJES, CHRISTOPHER P

ART UNIT	PAPER NUMBER
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1772

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/768,182	NAGASAWA, HIROSHI	
	Examiner	Art Unit	
	Christopher P. Bruenjes	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-9 and 13-17 is/are pending in the application.
- 4a) Of the above claim(s) 8 and 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4,6,7 and 13-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 2, 2007 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 6-7, 13, and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Kang et al (US 2002/0162456 A1).

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Regarding claim 1, Kang et al anticipate an article comprising a porous inorganic body that has a plurality of continuous pores passing through said porous body (p.2, paragraph 20). A surfactant such as alkylbenzene sulfonate is attached to surfaces of said continuous pores, since it is coated on the substrate, which contains pores and therefore must be attached to the surfaces of the pores (p.2, paragraph 21 and p.4, paragraph 38). The surfactant such as alkylbenzene sulfonate contains ionizable functional groups including the sulfonate and hydrophobic groups such as an alkyl group (p.4, paragraphs 37 and 38). Note diaphragm is given its broadest reasonable interpretation in light of the specification, which is a dividing membrane. The transport membrane of Kang et al is a dividing membrane in that it selectively prevents some material from passing through the membrane, so the membrane of Kang et al is a diaphragm. Note the preamble is given little patentable weight because the structure of the article is fully defined in the body of the claim and the preamble merely provides an intended use for the structure, which does not result in a structural difference between the claimed invention and the prior art. In this case, the structure taught by Kang et al being formed of a porous body having ionizable functional groups attached to the pores passing through the porous body

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would be capable of functioning as an ionic conductor.

Regarding claims 2-3, the porous body comprises a porous ceramic, which would include glass and alumina (p.2, paragraph 20 and p.5, paragraph 52). Regarding claim 6, the hydrophobic groups are alkyl groups. Regarding claim 7, the article of Kang et al is a flat sheet or hollow fiber, which have a plate shape or pipe shape respectively. Regarding claim 13, the article comprises surface-active agents that have ionizable functional groups such as sulfonate and attached to the hydrophobic groups such as the alkyl group. Regarding claim 15, the pores are continuous so they extend from one surface to the opposite surface. Regarding claim 16, the ionizable functional group is SO_3^- (p.4, paragraph 38 which shows that the surfactant is a sulfonate salt). Regarding claim 17, the ionizable functional group is $\text{N}^+(\text{CH}_3)_3$ (p.4, paragraph 39 that shows that the surfactant is a quaternary ammonium salt, which would form that functional group).

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Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this

Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 4 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang et al (US 2002/0162456 A1) in view of Kwasniewski et al (USPN 5,863,420).

Kang et al teach all that is claimed in claim 1 as shown above, but fail to explicitly teach the average diameter of the continuous pores and the porosity of the porous body. However, Kwasniewski et al teach that a transport membrane used in

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selectivity of alkenes obviously has a pore size of about 0.05 micron or 50nm and an overall porosity of about 40 percent (col.3, 1.66 - col.4, 1.3 and col.12, 1.10-15). Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made that porous bodies used as a transport membrane for alkenes have a pore size of about 50nm and overall porosity of about 40%, as taught by Kwasniewski et al.

Thus, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to select the average pore size of the porous body of Kang et al to be about 50nm and the overall porosity of the porous body to be about 40%, since Kwasniewski et al teach that those are well known values for the pores used in forming transport membranes for alkenes.

7. Claims 1-4, 6-7, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnabel et al (USPN 4,780,369).

Regarding claims 1-3, Schnabel et al teach an ionic conductor such as an ion exchanger membrane (col.1, 1.14-21). The conductor comprises a porous glass body (col.3, 1.8-10). The porous body has a plurality of continuous pores passing

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through said body because the pores are used to transport ions. Note diaphragm is given its broadest reasonable interpretation in light of the specification, which is a dividing membrane. The ion exchange membrane of Schnabel et al. is a dividing membrane in that it selectively prevents material other than ions to pass through the membrane, so the membrane of Schnabel et al. is a diaphragm. Schnabel et al. further teach that functional groups are attached to the surfaces of the continuous pores (col.12, 1.14-25). Schnabel et al. teach that the functional groups include hydrophobic groups and hydrophilic groups such as sulfonates, which are ionizable functional groups.

Schnabel et al. fail to explicitly teach that the hydrophobic groups of alkyl groups and the hydrophilic groups of ionizable functional groups such as sulfonates are attached to the pores at the same time. However, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made that the ion exchange membrane would not only require the sulfonate functional group since it is ionizable, but it would also be beneficial for the pores to contain hydrophobic groups such as alkyl groups in order to prevent the liquid in the cathode and anode from passing through the ion exchange conductor membrane.

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Thus, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention made to attach both the ionizable functional groups and hydrophobic groups taught by Schnabel et al to the continuous pores of the porous body of Schnabel et al since the ionizable functional groups would allow the ions to move through the pores and the hydrophobic groups would prevent the liquid from the cathode and anodes to pass through the pores, and both are characteristics desired for an ion exchange membrane, as taught by Schnabel et al.

Regarding claims 4 and 14, the average diameter of the continuous pores is in the range of 11 angstroms, which is 1.1nm, to 1000 angstroms, which is 100nm (col.4, 1.54-60). The porosity of the porous body is obviously within the broad range of 5 to 90% since the material is as an ion exchange membrane.

Regarding claim 6, the hydrophobic group is an alkyl group.

Regarding claim 7, the porous body is a hollow fiber (col.12, 1.14), wherein a hollow fiber has a pipe shape.

Regarding claim 15, the plurality of continuous pores extend from a surface to an opposite surface because the pores are used to transport ions across the membrane.

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Regarding claims 16 and 17, the ionizable functional groups are sulphonic acid or SO_3^- ; or amino formed from quaternary ammonium compound or $\text{N}^+(\text{CH}_3)_3$ (col.12, 1.42-53).

Response to Arguments

8. Applicant's arguments regarding the 35 U.S.C. 102 rejections of claims 1-3, 6, 7, and 13 as anticipated by Kang et al have been fully considered but they are not persuasive.

In response to Applicant's argument that Kang does not teach that the surfactant is attached to the surfaces of the continuous pores, applicant is arguing the claims narrower than the broadest reasonable interpretation. "Attached to surfaces of the continuous pores" only requires that the functional groups and hydrophobic groups be attached to any of the surfaces it does not require that it be attached to all of the surfaces or to a particular surface. By being a part of the solid polymer electrolyte that is attached to the porous support membrane the surfactant is attached to at least the end surfaces of the continuous pores. The surfactant of Kang et al may not be attached to the sidewalls of the continuous pores but it is connected to surfaces such as the end of the pores via the connection between the support membrane and the solid polymer electrode.

In response to Applicant's argument that Kang fails to teach the functional groups attached so that ions can move at relatively high speed with a minimum of resistance, this limitation is not claimed and does not change the claimed structure currently presented.

In response to Applicant's argument that Kang fails to teach using ionizable functional groups, the surfactant that Kang uses is either quaternary ammonium based or sulfonate based. Quaternary ammonium contain $N^+(CH_3)_3$ ions and alkylbenzene sulfonate salts contain SO_3^- ions.

9. Applicant's arguments regarding the 35 U.S.C. 103 rejections of claims 4 and 14 over Kang in view of Kwasniewski et al have been considered but are not persuasive for the same reasons as explained above with regard to the rejection of Kang of the independent claims.

10. Applicant's arguments regarding the 35 U.S.C. 103 rejections of claims 1-7 and 14 over Schnabel et al have been considered but are not persuasive.

In response to applicant's argument that Schnabel does not teach using ionizable functional groups, Schnabel specifically states the use of functional groups such as sulphonic acid and

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amino and explains amino comes from quaternary ammonium groups (col.12, 1.42-53).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P. Bruenjes whose telephone number is 571-272-1489. The examiner can normally be reached on Monday thru Friday from 8:00am-4:30pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher P Bruenjes
Examiner
Art Unit 1772

CPB
CPB
April 6, 2007



ALICIA CHEVALIER
PRIMARY EXAMINER